Appendix A

Professional Services Industries, Inc.
Groundwater Assessment Report
August 2000

PSI Information To Build On
Engineering • Consulting • Testing

HANNON RANCHES
SOIL & GROUNDWATER ASSESSMENT
IMPERIAL COUNTY, CALIFORNIA

CALTRANS CONTRACT NUMBER SA43A0012
TASK ORDER NUMBER 11-199361-VB

Prepared For

STATE OF CALIFORNIA
Department of Transportation, District 11 Environmental
Environmental Engineering—Hazardous Materials
Mail Station D-6, 2829 Juan Street
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CONTENTS

FIGURES

TABLES

APPENDICES

STATEMENT OF LIMITATIONS AND PROFESSIONAL CERTIFICATION

Information provided for Professional Services Industries, Inc., (PSI) report is intended exclusively for the California Department of Transportation (Caltrans). PSI is responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official view or policies of the State of California or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation. The professional services provided have been performed in accordance with practices generally accepted by other geologists, hydrologists, hydrogeologists, engineers, and environmental scientists practicing in this field. No other warranty, either expressed or implied, is made. As with all investigations, there is no guarantee that the work conducted will identify any and all sources or locations of contamination.

This report is issued with the understanding that Caltrans is responsible for ensuring that the information contained in this report is brought to the attention of the appropriate regulatory agency. A geologist who is registered in the State of California and whose signature and license number appears below has prepared this report.

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EXECUTIVE SUMMARY

PSI investigated a parcel identified as Hannon Ranches that will be purchased by Caltrans for the purpose of widening the existing Route 111 Freeway. The site is located approximately 2.5 miles south of the intersection of Main Street and Highway 111, located in the city of Brawley, California. Please refer to Figure 1 for the location of the project site. The site is located on the eastside of Highway 111, immediately south of a drainage feature identified on the USGS Brawley Quadrangle Map as the Lavender Canal. The access road that parallels this canal is named Schartz Road. The general objective of the investigation is to assess the properties for impacts of present or past use of chemical or hazardous waste situated on the properties. The following provides a brief summary of the results for each Area of Concern (AOC). For a more detailed summary, please refer to Sections 6.0 and 7.0.

AOC No. 1 – Above Ground Storage Tanks (ASTs): Thirteen borings were competed to depths between 5- and 10-feet below ground surface (bgs) and twenty-eight soil samples were collected. Additionally, seven groundwater samples were collected using temporary well points. Soil and groundwater samples were analyzed for total petroleum hydrocarbons as diesel (TPHd) and gasoline (TPHg). Additionally, the samples were analyzed for volatile organic hydrocarbons (VOCs). The laboratory data indicate that soil is impacted from the surface to approximately 5-feet bgs immediately adjacent to and beneath the dispenser pumps. The TPHd plume appears to have migrated laterally from the source area on a perched water-bearing zone, impacting soil in a thin 1- to 2-foot zone from 4-feet to 6-feet bgs. The area impacted is illustrated on Figures 3 and 4. Pending confirmation from the Regional Water Quality Control Board, it is likely that TPHd-impacted soil will require corrective action. Given the nature of the development, excavation and off-site disposal to a recycling facility appears to be the most cost-effective mechanism for clean up.

AOC No. 2 – Garage Area: Four borings completed to depths between 3- to 10-feet bgs were drilled and one groundwater and eleven soil samples were collected. The groundwater and soil samples were analyzed for VOCs and semivolatile organic compounds (SVOCs). The soil and groundwater data collected at this AOC do not appear to indicate the presence of a significant impact.

AOC No. 3 – Equipment Storage Area: Twelve borings were completed to 3-feet bgs and thirty-six soil samples were collected. Each sample was analyzed for heavy metals and pesticides. The soil data collected in this AOC does not appear to indicate the presence of a significant impact.

AOC No. 4 – Destroyed Dwelling: Four surface soil samples were collected within the footprint of a burnt down dwelling. One or more metals were detected in concentrations that exceeded the State of California screening criteria for disposal as a hazardous waste. The metal lead was detected in all four surface soil samples with total concentrations of 1,700 to 11,000 milligrams per kilogram, with the State limit being 1,000 milligrams per kilogram. Based on this, excavation of this material will likely be required with off-site disposal at an approved hazardous waste facility.

1.0 INTRODUCTION

This report has been prepared by Professional Services Industries, Inc. (PSI), for the State of California Department of Transportation, District 11 (Caltrans), under Contract Number SA43A0012, Task Order No 11-199361-VB. The location of the area of investigation is shown in Figure 1. PSI has investigated a property intended to be purchased by Caltrans for the purpose of widening the existing Route 111 Freeway.

2.0 BACKGROUND

The subject property is located in Imperial Valley along Route 111 in the path of the proposed highway-widening project. The property is presently being used for staging and maintaining farm equipment. The purpose of the Task Order is to investigate four areas of concern (AOCs) for the presence of contaminants of concern (COCs) in the surface and subsurface soil as well as the groundwater at the project site. The following is a summary of the AOCs investigated along with the COCs assessed for this investigation. Please refer to Figure 2 for location of the AOCs.

- AOC No. 1 – Above Ground Storage Tanks (ASTs): This AOC consists of two ASTs that are used to store diesel fuel situated together on the eastside of the project site. The dispensing pumps are located at the north end of the ASTs. In addition to the diesel fuel, Caltrans identified gasoline fuel and volatile organic compounds (VOCs) as COCs for this area of investigation.

- AOC No. 2 – Garage Area: This AOC consists of a free standing structure with the west and north sides enclosed and the south and east side open for access to farm equipment. The structure is apparently used to repair the various farm vehicles and equipment stored at the property. The COCs identified by Caltrans included VOCs and semivolatile organic compounds (SVOCs).

- AOC No. 3 – Equipment Storage Area: This AOC consists of an unpaved area used to store various pieces of farm equipment. The COCs identified by Caltrans included heavy metals, pesticides, and SVOCs.

- AOC No. 4 – Destroyed Dwelling: This AOC consists of the remains of a dwelling that was destroyed in a fire. The COCs identified by Caltrans included heavy metals and asbestos.

3.0 OBJECTIVE AND SCOPE OF WORK

3.1 OBJECTIVE

The objective of the scope of work is to assess the areas of concern identified above by collecting surface and subsurface soil along with groundwater samples and analyzing them for constituents of concern.

3.2 SCOPE OF WORK

The scope of work completed for this field investigation is summarized below:

- Contact Underground Service Alert (USA),
- Clear boring location sites using private utility locating subcontractor,
- Drill and collect soil samples,
- Collect groundwater samples using temporary well points,
- Develop Field Investigation Report detailing the results of the investigation.

The scope of work summarized in the Work Plan was modified in the field by PSI and the Caltrans Task Order Manager based on field observations completed during the field program summarized in Section 5.0.

4.0 SITE CHARACTERISTICS

The site is located approximately 2.5 miles south of the intersection of Main Street and Highway 111 located in the city of Brawley, California. The site is situated on the east side of Highway 111, immediately south of a drainage feature identified on the USGS Brawley Quadrangle Map as the Lavender Canal. The access road that parallels this canal is named Schartz Road. The United States Geological Survey Brawley Quadrangle Map (USGS, 1957) indicates that the project site is located in Township 14 South, Range 14 East, Section 15 at a surface elevation of approximately 130 below mean sea level (msl). The slope of the area is relatively flat, with a sight slope to the south. Please refer to Figure 1 for the location of the project site.

The project site is situated in the Imperial Valley Groundwater Basin, which is part of the Colorado Desert Hydrologic Area (DWR, 1975). The basin covers an area of approximately 1,870 square miles and drains into the Salton Sea to the north via the New River and Alamo River. The basin is underlain by Quaternary lake deposits (CDMG, 1962).

The field observations collected during the drilling and sampling program completed for this investigation indicates that the project site is underlain by interbedded silty and sandy clay. A thin perched water-bearing zone was encountered at approximately 5-feet below ground surface (bgs) at seven boring locations. This water-bearing zone appears to be approximately 1- to 2-foot thick and no other water bearing zone was encountered to the maximum depth investigated of 10-feet bgs.

5.0 FIELD ACTIVITIES

The investigation activities consisted of work plan and health & safety plan preparation, drilling, sampling and analyses of soil, soil gas, and groundwater samples. The Task Order Meeting was completed on May 1, 2000 with Mr. Jeffrey Friedman, R.G. of PSI and Ms. Diane Vermeulen, P.E. of Caltrans in attendance. The objective of this meeting was to mark each of the sampling locations for Underground Service Alert (USA) clearance and to discuss the scope of work.

5.1 HEALTH AND SAFETY PLAN AND WORKPLAN

Prior to the start of fieldwork, PSI prepared a Site Health and Safety Plan to comply with State Law and local regulations. The Health and Safety Plan was submitted to Caltrans for review and approval.

A Work Plan presenting the proposed field activities as well as the sampling and analysis plan was prepared and submitted to Caltrans for review and approval.

5.2 GEOPHYSICAL SURVEY

PSI also completed a geophysical survey of the project site on May 31, 2000. Subsurface Surveys of Solana Beach, California completed a survey of the boring locations. Subsurface Surveys used Ground Penetrating Radar (GPR), Magnetic Gradiometer, and Electromagnetic Induction (EM) instrumentation. The results of this survey are presented in Appendix A.

5.3 SUBSURFACE INVESTIGATION ACTIVITIES

On May 31, 2000 the sampling program outlined in the Work Plan was implemented. The program included the drilling and sampling of soil and groundwater using a direct-push drill rig. The following summarizes the sample collection portion of the fieldwork. Refer to Table 1 for a summary of the soil sample collection and analysis program used during this investigation. Refer to Appendix B for copies of the field boring logs and Appendix C for a summary of PSI sampling procedures.

5.3.1 Soil Sample Collection

Twenty-nine soil borings (Y-1 through Y-12, AST-1 through AST 13, G-1 through G-3, and GW-1) were drilled in AOCs 1, 2, and 3 using a direct-push drill rig provided by Vironex of Santa Ana, California. An additional four surface samples (H-1 through H-4) were collected by a PSI sampling technician from AOC No. 4 (Destroyed Dwelling). The soil samples collected from AOCs 1, 2, and 3 were obtained from a down-hole sampler equipped with acetate sampling tubes, which were sealed with Teflon-lined plastic caps, labeled, and placed in an ice chest for eventual transport to a California certified laboratory. At depths specified in the work plan, soil samples were also collected for visual identification using the Unified Soil Classification System (USCS). Additionally, a representative sample was placed in a zip-lock-type plastic bag for a

period of time for eventual screening by a field photo-ionization detector (PID). The sampling equipment was de-contaminated between each sample and the drilling equipment was de-contaminated between each boring following the general procedures outlined in the Work Plan and summarized in Appendix C. The borings were abandoned using a cement/bentonite mixture. The surface soil samples were collected by placing the samples in laboratory prepared sample jars, sealed and labeled. These samples were sent along with the above subsurface soil samples to the analytical laboratory with chain of custody documentation.

5.3.2 Groundwater Sample Collection

As indicated in the Work Plan, groundwater samples were obtained from the specific locations indicated on Figure 2. Seven water samples were placed in laboratory supplied sample containers, labeled, and placed in an ice chest for transport to a California certified laboratory with chain of custody documentation. The samples were collected from sample locations AST-1 through AST-5, AST 7, and GW-1. Once the water samples were obtained, the drill rod was removed and the borings were abandoned as previously described. Please refer to Appendix C for a summary of PSI's sampling procedures.

6.0 LABORATORY ANALYSES & RESULTS

This section of the report provides a summary of the analytical methods and results from the sampling and analysis program implemented for this investigation.

6.1 METHODOLOGY

The soil and groundwater samples collected during this investigation were submitted to Centrum Analytical Laboratories, Inc. (Centrum) located in Redlands, California. The laboratory is State of California Department of Health Services certified hazardous waste laboratories (Environmental Laboratory Accreditation Program [ELAP] #2419). The soil and groundwater samples were submitted for 48-hour laboratory turnaround as specified in the Work Plan. Refer to Table 1 for the analyses performed on each sample collected. For a summary of the number of samples analyzed by matrix, refer to the following table.

USEPA Method/COC	Soil	Water
6000 & 7000 Series/Total Metals (CCR 17 Metals)	40	0
6000 & 7000 Series/Soluble Metals	10	0
Toxicity Characteristic Leaching Procedure EPA 1311 (TCLP)	4	0
8015/Total Petroleum Hydrocarbons as Gasoline (TPHg)	27	6
8015/Total Petroleum Hydrocarbons as Diesel (TPHd)	27	6
8081/Organochlorine Pesticides	36	0
8141/Organophosphorus Pesticides	36	0
8260/Volatile Organic Compounds (VOCs)	38	7
8270/Semivolatile Organic Compounds (SVOCs)	47	1
Polarized Light Microscopy (PLM)/Asbestos	4	0

6.2 Soil Sample Results

This section provides a summary of the soil quality results for the investigation. A total of 78 soil samples were analyzed for various constituents of concern. The results of the analyses are summarized in Tables 2, 3, and 4. Refer to Appendix D for copies of the laboratory reports and chain of custody documentation.

Metals Results

Forty soil samples collected from AOCs 3 and 4 were analyzed for California Code of Regulation (CCR) seventeen metals. The following provides a summary of the metals results by AOC.

AOC No. 3 – Equipment Storage Area: Of the thirty-six soil samples, only the surface soil sample collected at boring Y-5 had a metal detected above screening criteria discussed in the work plan (10 times the Soluble Threshold Limit Concentration [STLC]). Total lead was detected at 88 mg/kg, while the STLC was reported at 5.4 mg/l. This result is above the STLC California Code of Regulation (CCR) screening criteria (5 mg/l) of for determining if a waste material is required to be disposed of as a hazardous or non hazardous waste.

AOC No. 4 – Destroyed Dwelling: Barium, copper, lead, and zinc were reported in concentrations that exceeded the screening criteria 10 times the STLC in the surface samples collected from sample locations H-1 through H-4. Barium, lead, and zinc were detected in concentrations that exceeded both the CCR Total Threshold Limit Concentration (TTLC) and STLC screening criteria. The range of total concentration results for these metals are as follows: barium -- 680 to 3,300 mg/kg, copper -- 110 to 460 mg/kg, lead -- 1,700 to 11,000 mg/kg, zinc -- 1,700 to 13,000 mg/kg. Refer to Table 2 for a summary of these results. Due to the elevated soluble barium and lead content detected, each sample was extracted using the Toxicity Characteristic Leaching Procedure (TCLP) and re-analyzed. The results for barium ranged from not detected to 6.6 mg/l and lead ranged from 0.53 mg/l to 16 mg/l.

Asbestos Results

AOC No. 4 – Destroyed Dwelling: The four surface samples collected from AOC No. 4 were tested for the presence of asbestos fibers. No asbestos fibers were observed using the Polarized Light Microscopy (PLM).

TPH Diesel and Gasoline Results

AOC No. 1 – Above Ground Storage Tanks (ASTs): The analytical data indicates that the area immediately adjacent and beneath the dispenser pumps located along the north side of the two ASTs has been impacted by the release of total petroleum hydrocarbons characterized as diesel (TPHd). The surface area impacted by TPHd is defined by the data collected at the location of borings AST-3 and 5, with concentrations of 960 milligrams per kilogram (mg/kg) and 36,000 mg/kg, respectively. The footprint of the TPHd-impacted soil appears to increase

in size at 5-feet below ground surface (bgs), with concentrations above 1,000 mg/kg for soil samples collected from borings AST-3, 5, and 9. The range of concentrations at these boring locations is 9,500 mg/kg to 51,000 mg/kg. There is a significant decrease in TPHd concentration at 10-feet bgs. Out of the eight soil samples collected at this depth, TPHd was only detected in the sample collected at boring location AST-5 (16 mg/kg). Total petroleum hydrocarbons characterized as gasoline (TPHg) was not detected in the soil samples. Refer to Table 3 for a summary of the USEPA Method 8015 results.

Volatile Organic Compounds

AOC No. 1 – Above Ground Storage Tanks (ASTs): Twenty-seven soil samples were analyzed for volatile organic compounds (VOCs) by USEPA Method 8260B. Fourteen compounds were reported in concentrations that exceeded the laboratory detection limits. Of these soil samples, the compounds reported in the highest concentrations are those soil samples with elevated TPHd results collected at 5-feet bgs. The following table provides a summary of the range of concentrations by compounds detected in the soil sample collected at 5-feet bgs:

Compounds Detected at 5-Feet bgs	Range
Benzene	Detected in one soil sample at 1 µg/kg
n-Butylbenzene	84 µg/kg to 13,000 µg/kg
Ethylbenzene	7 µg/kg to 4,900 µg/kg
Isopropylbenzene	17 µg/kg to 1,500 µg/kg
p-Isopropyltoluene	8 µg/kg to 2,100 µg/kg
Methyl-tert-butyl ether	Detected in one soil sample at 16 µg/kg
Napthalene	3 µg/kg to 4,600 µg/kg
n-Propylbenzene	20 µg/kg to 5,700 µg/kg
Toluene	Detected in one soil sample at 260 µg/kg
1,2,4-Trimethylbenzene	51 µg/kg to 27,000 µg/kg
1,3,5-Trimethylbenzene	6 µg/kg to 8,300 µg/kg
Total Xylenes	30 µg/kg to 8,800 µg/kg

AOC No. 2 – Garage Area: Four compounds were detected in soil samples obtained from borings G-1, G-3, and GW-1. The following is a summary of the compounds detected with the range of concentrations: Napthalene -- 16 µg/kg to 200 µg/kg, Toluene -- detected in one soil sample at 1 µg/kg, 1,2,4-Trimethylbenzene -- 1 µg/kg to 4 µg/kg, and 1,3,5-Trimethylbenzene -- detected in one soil sample at 1 µg/kg.

Semivolatile Organic Compounds

AOC No. 3 – Equipment Storage Area: Of the thirty-six soil samples analyzed for SVOCs by USEPA Method 8270, only two soil samples had compounds reported in concentrations above laboratory detection limits. The compound phenol was reported in surface soil sample Y-8-0 and Y-9-1.5 at 170 µg/kg-and 140 µg/kg, respectively.

AOC No. 2 – Garage Area: Fifteen SVOCs were detected in soil samples collected from borings G-1, G-2, and G-3. The following table provides a summary of the compounds detected and their associated range of concentrations.

Compounds Detected	Range
Acenaphthene	95 µg/kg to 580 µg/kg
Anthracene	170 µg/kg to 800 µg/kg
Benzo(a)anthracene	100 µg/kg to 770 µg/kg
Benzo(a)pyrene	110 µg/kg to 260 µg/kg
Benzo(b)fluoranthene	110 µg/kg to 480 µg/kg
Benzo(k)fluoranthene	110 µg/kg to 480 µg/kg
Butylbenzylphthalate	81 µg/kg to 130 µg/kg
bis(2-Ethylhexyl)phthalate	Detected in one soil sample at 18,000 µg/kg
Chrysene	120 µg/kg to 440 µg/kg
Dibenzofuran	200 µg/kg to 640 µg/kg
Fluoranthene	450 µg/kg to 2,400 µg/kg
Fluorene	160 µg/kg to 840 µg/kg
2-Methylnaphthalene	66 µg/kg to 1,500 µg/kg
Naphthalene	100 µg/kg to 300 µg/kg
Pyrene	450 µg/kg to 1,800 µg/kg

Pesticides

AOC No. 3 – Equipment Storage Area: Of the thirty-six soil samples analyzed for Organochlorine pesticides by USEPA Method 8081 and Organophosphorus pesticides by USEPA Method 8141, only eight soil sample had compounds reported in concentrations above laboratory detection limits. The pesticide Beta-BHC was detected in one soil sample at 5 µg/kg. The compound 4,4'DDE was detected in eight soil samples ranging in concentration from 2 µg/kg to 600 µg/kg. The pesticide 4,4'DDT was detected in six soil samples ranging in concentration from 7 µg/kg to 280 µg/kg.

6.3 Groundwater Sample Results

Six groundwater samples were collected from AOC No. 1 and one sample was collected from AOC No. 2. The following provides a summary of these results by AOC.

TPH Diesel and Gasoline Results

AOC No. 1 – Above Ground Storage Tanks (ASTs): Groundwater samples were collected from borings AST-1, 2, 3, 4, 5, and 7. Total petroleum hydrocarbons as diesel were detected in concentrations that range from 0.97 to 5.3 milligrams per liter (mg/l). No petroleum hydrocarbons characterized as gasoline were detected.

Volatile Organic Compounds

AOC No. 1 – Above Ground Storage Tanks (ASTs): Eleven VOCs were detected in the six groundwater samples collected from boring locations AST-1 through AST-5 and AST-7. The following table provides a summary of the compounds detected along with the range of concentrations.

Compounds Detected	Range
Acetone	61 µg/l to 940 µg/l
Benzene	0.8 µg/l to 1 µg/l
2-Butanone (MEK)	Detected in one groundwater sample at 12 µg/l
Ethylbenzene	0.9 µg/l to 2.3 µg/l
Methyl-tert-butyl ether	2.5 µg/l to 6.5 µg/l
Napthalene	1.1 µg/l 2 µg/l
n-Prpylbenzene	Detected in one groundwater sample at 0.9 µg/l
Toluene	0.7 µg/l to 0.9 µg/l
1,2,4-Trimethylbenzene	1.5 µg/l to 4.6 µg/l
1,3,5-Trimethylbenzene	Detected in one groundwater sample at 1.3 µg/l
Total Xylenes	1.9 µg/l to 4.1µg/l

AOC No. 2 – Garage Area: The compound toluene (0.6 µg/l) was the only compound detected above the laboratory detection limits in the sample collected at this AOCs.

Semivolatile Organic Compounds

AOC No. 2 – Garage Area: Only one groundwater sample was analyzed for SVOCs by USEPA Method 8270. None of the compounds were reported in concentrations above the laboratory detection limits.

7.0 DISCUSSION

The site is located approximately 2.5 miles south of Main Street and Highway 111 located in the city of Brawley, California. Please refer to Figure 1 for the location of the project site. The site is located on the east side of Highway 111, immediately south of a drainage feature identified on the USGS Brawley Quadrangle Map as the Lavender Canal. The access road that parallels this canal is named Schartz Road. The general objective of the investigation is to assess the properties for impacts of present or past use of chemical or hazardous waste situated on the properties.

The project site is situated in the Imperial Valley Groundwater Basin, which is part of the Colorado Desert Hydrologic Area (DWR, 1975). The basin covers an area of approximately 1,870 square miles and drains into the Salton Sea to the north via the New River and Alamo River. The basin is underlain by Quaternary lake deposits (CDMG, 1962).

The field observations collected during the drilling and sampling program indicate that the project site is underlain by interbedded silty and sandy clay. A thin perched water-bearing zone was encountered at approximately 5-feet bgs at seven boring locations. This water-bearing zone appears to be approximately 1-foot thick and no other water bearing zone was encountered to the maximum depth investigated of 10-feet bgs.

To meet the above stated objectives, nearly 80 soil samples were collected from thirty-three sample locations. The following provides a summary of the investigation and results for the four Areas of Concern (AOCs) assessed during the field activities.

AOC No. 1 – Above Ground Storage Tanks (ASTs): Thirteen borings were competed to depths between 5- and 10-feet bgs and twenty-eight soil samples were collected. Six groundwater samples were also collected using temporary well points. Soil and groundwater samples were analyzed for total petroleum hydrocarbons as diesel (TPHd) and gasoline (TPHg). Additionally, the samples were analyzed for volatile organic compounds (VOCs).

Based on both field observations and analytical data, the area immediately adjacent and beneath the dispenser pumps located along the north side of the two ASTs has been impacted by the release of TPHd. The surface area impacted by TPHd is defined by the data collected at the location of borings AST-3 and 5, with concentrations of 960 mg/kg and 36,000 mg/kg, respectively. The footprint of the TPHd-impacted soil appears to increase in size at 5-feet bgs, with concentrations above 1,000 mg/kg for soil samples collected from borings AST-3, 5, and 9. The range of concentrations at these boring locations is 9,500 mg/kg to 51,000 mg/kg. There is a significant decrease in TPHd concentration at 10-feet bgs. Out of the eight soil samples collected at 10-feet bgs, TPHd was only detected in the sample collected at boring location AST-5 (16 mg/kg). Six groundwater samples were also collected from the perched water-bearing zone encountered at approximately 5-feet bgs. Groundwater samples were collected from borings AST-1, 2, 3, 4, 5, and 7. Total petroleum hydrocarbons as diesel were detected in concentrations that range from 0.97 to 5.3 milligrams per liter (mg/l). No petroleum hydrocarbons characterized as gasoline were detected. However, various volatile organic compounds (VOCs) were detected, which included benzene, ethylbenzene, toluene, total xylenes (BTEX), methyl-tert-butyl ether (MTBE), and napthalene. These compounds are commonly associated with the release of gasoline.

AOC No. 2 – Garage Area: Four borings completed to depths between 3- to 10-feet bgs were drilled and one groundwater and eleven soil samples were collected. The groundwater and soil samples were analyzed for VOCs and semivolatile organic compounds (SVOCs).

Numerous VOCs and SVOCs were detected in the soil samples collected from these borings. The largest number of compounds were detected in the three soil samples collected from boring G3. However, none of the compounds were detected in concentrations that exceeded United States Environmental Protection Agency (USEPA) Region 9 Preliminary Remedial Goals (PRGs). Please refer to the summary of the PRGs provided on Table 6. The results from the groundwater sample collected from boring GW-1 did not indicate the presence of SVOCs above the laboratory detection limits. However, toluene was detected at 0.6 micrograms per liter (µg/l).

AOC No. 3 – Equipment Storage Area: Twelve borings completed to 3-feet bgs and thirty-six soil samples were collected. Each sample was analyzed for heavy metals and pesticides.

Of the thirty-six soil samples, only the surface soil sample collected at boring Y-5 had a metal detected above screening criteria discussed in the work plan (10 times the STLC). Total lead was detected at 88 mg/kg, while the STLC was reported at 5.4 mg/l. Since only one sample out of thirty-six exceeded the screening criteria, the lead result should be considered a *de minimis* impact to the project site. In addition to lead, three pesticides were detected in soil samples collected from the surface to approximately 1.5-feet bgs. These compounds included Beta-BHC detected in one sample at 5 µg/kg, 4,4'DDE (DDE) detected in eight soil samples ranging in concentration from 2 µg/kg to 600 µg/kg, and 4,4'DDT (DDT) detected in six soil samples ranging in concentration from 7 µg/kg to 280 µg/kg. The concentrations reported for these soil samples did not exceed Total Threshold Concentrations Limit (TTLC) of 1,000 µg/kg for DDT or DDE. There is no listed TTLC for Beta-BHC. Additionally, the reported concentrations are below USEPA Region 9 PRGs.

AOC No. 4 – Destroyed Dwelling: Four surface soil samples were collected within the footprint of a burnt down dwelling.

Each sample was analyzed for CCR seventeen metals and asbestos. Barium, copper, lead, and zinc were reported in concentrations that exceeded the screening criteria discussed above. Barium, lead, and zinc were also detected in concentrations that exceeded TTLCs and STLCs. No asbestos fibers were detected in the four soil samples. Therefore, if this material encountered within the footprint of the former dwelling is excavated as part of the construction of the right-of-way, it will likely need to be disposed of as a hazardous waste.

8.0 CONCLUSIONS & RECOMMENDATIONS

This section provides a summary of conclusions and recommendations based on the data collected during this investigation.

8.1 CONCLUSIONS

The following conclusions are based on the field observations and analytical data collected during this investigation:

- The project site is underlain by fine-grained material consisting primarily of clay with silt and very fine sand.

- Groundwater was encountered at approximately 5-feet bgs at seven boring locations. This water bearing zone appears to be perched and approximately 1- to 2-feet thick. No groundwater was encountered beneath this perch zone to the maximum depth investigated (10-feet bgs).

- The area immediately adjacent to and below the dispenser pumps located within AOC No. 1 (ASTs) has been impacted by fuel hydrocarbons in the diesel carbon range. The impact appears to be limited to the surface area immediately north and east of the dispenser pumps to a depth of 5- to 6-feet bgs. The shallow groundwater appears to be marginally impacted by the release of the fuel hydrocarbons.

- The surface soil samples collected within the footprint of the former house (AOC No. 4) have metal concentrations that exceed the State of California screening criteria for hazardous waste disposal. These metals include barium, lead, and zinc. These samples were extracted using the TCLP and re-analyzed for barium and lead. The results indicated that one soil sample had elevated lead content in a concentration that exceeded the 5 mg/l limit for what would be considered a RCRA hazardous waste.

- Remedial action activities will likely be required by the California Regional Water Quality Control Board (RWQCB) for the diesel impacted soil encountered at the AST site. Based on conversations with representatives of the RWQCB, a clean-up standard of 1,000 mg/kg for diesel-impacted soil will likely be implemented for the project site.

8.2 RECOMMENDATIONS

The following recommendations are based on the field observations and analytical data collected during this investigation:

- Submit the information contained in this report to the County Department of Environmental Health and the RWQCB for review and comment.

9.0 REMEDIAL OPTIONS

Based on the data collected during the field investigation, the location of the project site (rural farm land), and the plan future use as a highway, two areas of concern will likely require some level of remedial activity. These AOCs are the above ground storage tank location (AOC No. 1) and the destroyed dwelling (AOC No. 4). The following provides a summary of estimated clean-up standard that will likely be implemented on the site along with potential remedial options to be considered during regulatory agency negotiations. Final approval for both clean-up standards and remedial options implemented at the project site could require formal regulatory approval prior to implementation.

9.1 CLEAN-UP CRITERIA

The following table provides a summary of clean-up standards that will likely be implemented at the project site.

AOC No./Location	Constituent	Matrix	Highest Investigation Results	Standard	Source
1/ASTs	Diesel	Soil	51,000 mg/kg	1,000 mg/kg	RWQCB
4/Dwelling	Lead	Soil	11,000 mg/kg 520 mg/l 16 mg/l	TTLC = 1,000 mg/kg STLC = 5 mg/l TCLP = 5 mg/l	CCR CCR CFR
4/Dwelling	Barium	Soil	3,300 mg/kg 310 mg/l 6.6 mg/l	TTLC = 10,000 mg/kg STLC = 100 mg/l TCLP = 100 mg/l	CCR CCR CFR
4/Dwelling	Zinc	Soil	13,000 mg/kg 630 mg/l	TTLC = 5,000 mg/kg STLC = 250 mg/l	CCR

Note:
CCR – California Code of Regulation
CFR – Code of Federal Regulation

9.2 REMEDIAL ACTION ALTERNATIVE ASSESSMENT FOR AST SITE

Using the above referenced proposed clean-up standards, two clean-up alternatives are evaluated for potential implementation at the project site. As requested in the contract, the "Do Nothing" alternative is assessed. Additionally, per our conversation with the Caltrans contract manager, the Excavation and Removal alternative is evaluated. Given the subsurface conditions (predominately low permeability material consisting of clay) and the likely need for significant future grading activities associated with the construction of the highway, no other in situ remedial activity is considered at this time. However, should Caltrans elect to assess other alternatives in the future, PSI could provide an evaluation of those options upon request.

9.2.1 Do Nothing Alternative

PSI contacted both the Imperial County Department of Environmental Health (ICDEH) and the Colorado Desert Regional Office of the Water Quality Control Board (RWQCB) to assess potential clean-up standards for diesel impacted soil. According to Mr. Tom Wolf of the ICDEH, the RWQCB is responsible for determining soil clean-up standards for petroleum release sites located with Imperial County. Mr. Abdi Haile of the RWQCB indicated that before a clean-up standard could be determined, an assessment report would have to be provided for review and comment. However, given the rural setting and the proposed future use, he did indicate that 1,000 mg/kg of TPH as diesel would be a likely standard for this project. Based on this likely standard and the presence of TPHd in soil samples collected during this investigation at concentrations as high as 51,000 mg/kg, the "Do Nothing" alternative is not considered a likely option for this project.

9.2.2 Excavation and Removal

It is likely that some sort of remedial option will be required given the concentrations of TPHd encountered at the project site. Given the planned future use of the area of concern as a highway and that significant grading activities will likely be implemented, it is PSI's suggestion that the impacted area be excavated and diesel-impacted soil be transported to an off-site disposal facility. The footprint of the area impacted by the diesel release above 1,000 mg/kg is provided on Figures 3 and 4. A review of these figures and Table 3 indicates that the impact is likely limited in depth to 1.5- to 1.8- meters (5- to 6-feet) bgs and area of approximately 75 square meters (800 square feet). Based on this estimate, up to 135 cubic meters (177 cubic yards) of soil could need to be excavated. Field screening using field observations and/or a mobile laboratory may further minimize the volume of soil excavated and transported to an off-site disposal facility. Depending upon the final volume excavated and site restoration requirements, the cost to complete this remedial option could range from $30,000 to $60,000. Verification soil sampling should be implemented as part of the site closure process. The estimated disposal costs assumes that the material will be transported to the TPS Technologies, Inc facility located in Adelanto, California for thermal treatment. Assuming 1.5 tons per cubic yard and a transportation and disposal cost of $62 per ton, the estimated disposal cost for 177 cubic yards would be approximately $16,500.

9.3 Remedial Action Alternative Assessment For Destroyed Dwelling Site

The two proposed alternatives were evaluated based on requirements established in the California Code of Regulations for disposal of hazardous waste at a landfill. PSI used the Total Threshold Limit Concentration (TTLC) and the Soluble Threshold Limit Concentration (STLC) for metals detected in the four surface samples collected within the footprint of the destroyed dwelling. Refer to Section 9.1 and Table 2 for a summary of the results and the standards used for this discussion.

9.3.1 Do Nothing Alternative

Since the debris will likely be removed from the project site prior to grading, the material sampled will need to be disposed of at an approved facility. Given the elevated concentrations of barium, lead, and zinc detected in the surface samples, the "Do Nothing" alternative is not considered an acceptable option for this project.

9.3.2 Excavation and Removal

The footprint of the destroyed dwelling is estimated to be approximately 250 square meters (2,700 square feet). The surface area impacted due to wind or surface water run-off beyond the footprint of the structure; nor is the depth of the impact known. Given that the constituents of concern are metals, it is assumed that the depth of the impact is limited to 0.5-meter (approximately 1.5 feet) and significant impact of metals to surface soil is limited to twice the area of the footprint of the dwelling (500 square meters or (5,400 square feet). Assuming these parameters, up to 125 cubic meters (150 cubic yards) of soil and debris could be excavated. Additional soil sampling could be used to aid in assessing the lateral and vertical impact and possible waste disposal options, and thus potentially reduce the estimated volume. Based on the elevated lead content that exceeds the CFR soluble limit of 5 mg/l, it is assumed that the material removed from the project site will have to transported as a RCRA Hazardous Waste requiring landfill disposal following treatment/stabilization of the lead to meet land disposal restrictions. The estimated cost per ton to dispose of this material at the Safety-Kleen Imperial Valley facility is approximately $243 per ton. Assuming 1.5 tons per cubic yard, the estimated disposal cost is $55,000. If additional sample collection and analysis indicates that the waste material meets non-RCRA standards the cost for disposal could be cut by as much as fifty percent.

10.0 REFERENCES

CDMG, 1962, San Diego-El Centro Sheet, Geologic Map of California, Scale 1:250,000.

DWR, 1997, Compilation of Federal and State Drinking Water Standards and Criteria, Quality Assurance Technical Document 3, Department of Water Resources.

DWR, 1975, California Ground Water, Department of Water Resources Bulletin No. 118.

USGS, 1957, Brawley Quadrangle, 7.5 Minute Series Topographic Map.